

1. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 7x^4 + 2x^3 + 2x^2 + 2x + 6$$

- A. $\pm 1, \pm 7$
- B. All combinations of: $\frac{\pm 1, \pm 7}{\pm 1, \pm 2, \pm 3, \pm 6}$
- C. All combinations of: $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 7}$
- D. $\pm 1, \pm 2, \pm 3, \pm 6$
- E. There is no formula or theorem that tells us all possible Rational roots.

2. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 6x^4 + 6x^3 + 3x^2 + 2x + 4$$

- A. $\pm 1, \pm 2, \pm 4$
- B. All combinations of: $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$
- C. All combinations of: $\frac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$
- D. $\pm 1, \pm 2, \pm 3, \pm 6$
- E. There is no formula or theorem that tells us all possible Integer roots.

3. Factor the polynomial below completely, knowing that $x + 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 8x^4 - 14x^3 - 167x^2 + 455x - 300$$

- A. $z_1 \in [-4.25, -3.95], z_2 \in [-0.88, -0.53], z_3 \in [-0.67, -0.65],$ and $z_4 \in [4.9, 5.1]$
- B. $z_1 \in [-5.08, -4.64], z_2 \in [0.79, 1.43], z_3 \in [1.47, 1.53],$ and $z_4 \in [2.5, 4.4]$

- C. $z_1 \in [-5.08, -4.64]$, $z_2 \in [-0.31, 0.74]$, $z_3 \in [0.76, 0.84]$, and $z_4 \in [2.5, 4.4]$
- D. $z_1 \in [-4.25, -3.95]$, $z_2 \in [-3.36, -2.87]$, $z_3 \in [-0.63, -0.53]$, and $z_4 \in [4.9, 5.1]$
- E. $z_1 \in [-4.25, -3.95]$, $z_2 \in [-2.41, -0.84]$, $z_3 \in [-1.26, -1.22]$, and $z_4 \in [4.9, 5.1]$

4. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{4x^3 - 12x + 6}{x + 2}$$

- A. $a \in [3, 8]$, $b \in [-13, -10]$, $c \in [15, 25]$, and $r \in [-67, -61]$.
- B. $a \in [3, 8]$, $b \in [8, 10]$, $c \in [-1, 8]$, and $r \in [8, 15]$.
- C. $a \in [-10, -4]$, $b \in [10, 17]$, $c \in [-48, -42]$, and $r \in [94, 97]$.
- D. $a \in [3, 8]$, $b \in [-9, 0]$, $c \in [-1, 8]$, and $r \in [-5, 4]$.
- E. $a \in [-10, -4]$, $b \in [-20, -15]$, $c \in [-48, -42]$, and $r \in [-85, -81]$.

5. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{20x^3 - 63x^2 + 23}{x - 3}$$

- A. $a \in [57, 65]$, $b \in [113, 120]$, $c \in [350, 355]$, and $r \in [1074, 1078]$.
- B. $a \in [17, 22]$, $b \in [-130, -118]$, $c \in [369, 371]$, and $r \in [-1085, -1082]$.
- C. $a \in [57, 65]$, $b \in [-245, -241]$, $c \in [729, 731]$, and $r \in [-2169, -2161]$.
- D. $a \in [17, 22]$, $b \in [-5, 0]$, $c \in [-13, -7]$, and $r \in [-6, 4]$.
- E. $a \in [17, 22]$, $b \in [-29, -22]$, $c \in [-47, -42]$, and $r \in [-70, -68]$.

6. Factor the polynomial below completely, knowing that $x - 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 12x^4 - 113x^3 + 338x^2 - 395x + 150$$

- A. $z_1 \in [-5.35, -4.91]$, $z_2 \in [-6.33, -4.95]$, $z_3 \in [-2.42, -1.69]$, and $z_4 \in [-0.34, -0.14]$
- B. $z_1 \in [-5.35, -4.91]$, $z_2 \in [-2.13, -1.6]$, $z_3 \in [-1.8, -1.62]$, and $z_4 \in [-0.84, -0.74]$
- C. $z_1 \in [0.72, 1.07]$, $z_2 \in [1.35, 1.95]$, $z_3 \in [1.61, 2.61]$, and $z_4 \in [4.79, 5.08]$
- D. $z_1 \in [0.59, 0.69]$, $z_2 \in [1.11, 1.62]$, $z_3 \in [1.61, 2.61]$, and $z_4 \in [4.79, 5.08]$
- E. $z_1 \in [-5.35, -4.91]$, $z_2 \in [-2.13, -1.6]$, $z_3 \in [-1.44, -1.27]$, and $z_4 \in [-0.68, -0.44]$
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7. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 25x^3 - 100x^2 - 4x + 16$$

- A. $z_1 \in [-4.6, -3.3]$, $z_2 \in [-2.65, -2.36]$, and $z_3 \in [2.09, 3]$
- B. $z_1 \in [-2.9, -2.4]$, $z_2 \in [1.93, 2.94]$, and $z_3 \in [3.93, 4.24]$
- C. $z_1 \in [-4.6, -3.3]$, $z_2 \in [-2.25, -1.76]$, and $z_3 \in [-0.2, 0.15]$
- D. $z_1 \in [-1.6, 0.4]$, $z_2 \in [0.19, 0.79]$, and $z_3 \in [3.93, 4.24]$
- E. $z_1 \in [-4.6, -3.3]$, $z_2 \in [-0.56, -0.04]$, and $z_3 \in [0.11, 1.11]$
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8. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 20x^3 + 31x^2 - 38x - 40$$

- A. $z_1 \in [-0.92, -0.65]$, $z_2 \in [1.12, 1.47]$, and $z_3 \in [1.78, 2.59]$

- B. $z_1 \in [-5.08, -4.9]$, $z_2 \in [-0.09, 0.27]$, and $z_3 \in [1.78, 2.59]$
 C. $z_1 \in [-1.46, -1.02]$, $z_2 \in [0.78, 1.08]$, and $z_3 \in [1.78, 2.59]$
 D. $z_1 \in [-2.2, -1.8]$, $z_2 \in [-1.59, -1.18]$, and $z_3 \in [0.41, 0.86]$
 E. $z_1 \in [-2.2, -1.8]$, $z_2 \in [-0.86, -0.52]$, and $z_3 \in [1.1, 1.49]$

9. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{6x^3 - 2x^2 - 20x + 19}{x + 2}$$

- A. $a \in [-15, -8]$, $b \in [-28, -25]$, $c \in [-72, -68]$, and $r \in [-132, -124]$.
 B. $a \in [-15, -8]$, $b \in [22, 24]$, $c \in [-66, -63]$, and $r \in [144, 149]$.
 C. $a \in [1, 11]$, $b \in [-21, -19]$, $c \in [34, 46]$, and $r \in [-103, -97]$.
 D. $a \in [1, 11]$, $b \in [8, 17]$, $c \in [-3, 4]$, and $r \in [15, 20]$.
 E. $a \in [1, 11]$, $b \in [-14, -9]$, $c \in [7, 9]$, and $r \in [2, 4]$.

10. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{6x^3 - 20x^2 - 2x + 19}{x - 3}$$

- A. $a \in [5, 9]$, $b \in [-40, -34]$, $c \in [111, 115]$, and $r \in [-322, -313]$.
 B. $a \in [15, 21]$, $b \in [-76, -72]$, $c \in [218, 224]$, and $r \in [-646, -637]$.
 C. $a \in [5, 9]$, $b \in [-14, -3]$, $c \in [-23, -16]$, and $r \in [-18, -15]$.
 D. $a \in [5, 9]$, $b \in [-6, 6]$, $c \in [-15, -7]$, and $r \in [-6, -3]$.
 E. $a \in [15, 21]$, $b \in [29, 35]$, $c \in [95, 104]$, and $r \in [318, 321]$.

11. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 7x^3 + 7x^2 + 3x + 5$$

- A. All combinations of: $\frac{\pm 1, \pm 5}{\pm 1, \pm 7}$
- B. $\pm 1, \pm 7$
- C. $\pm 1, \pm 5$
- D. All combinations of: $\frac{\pm 1, \pm 7}{\pm 1, \pm 5}$
- E. There is no formula or theorem that tells us all possible Rational roots.

12. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 4x^4 + 3x^3 + 3x^2 + 3x + 6$$

- A. All combinations of: $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$
- B. All combinations of: $\frac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 2, \pm 3, \pm 6}$
- C. $\pm 1, \pm 2, \pm 4$
- D. $\pm 1, \pm 2, \pm 3, \pm 6$
- E. There is no formula or theorem that tells us all possible Rational roots.

13. Factor the polynomial below completely, knowing that $x + 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 9x^4 + 27x^3 - 127x^2 - 155x + 150$$

- A. $z_1 \in [-5.2, -4.9]$, $z_2 \in [-1.81, -1.57]$, $z_3 \in [0.65, 0.78]$, and $z_4 \in [1.9, 4.5]$
- B. $z_1 \in [-5.2, -4.9]$, $z_2 \in [-0.62, -0.5]$, $z_3 \in [1.46, 1.56]$, and $z_4 \in [1.9, 4.5]$
- C. $z_1 \in [-4.5, -1.9]$, $z_2 \in [-0.8, -0.62]$, $z_3 \in [1.62, 1.74]$, and $z_4 \in [3.6, 5.7]$

- D. $z_1 \in [-4.5, -1.9]$, $z_2 \in [-0.25, -0.17]$, $z_3 \in [4.88, 5.04]$, and $z_4 \in [3.6, 5.7]$
- E. $z_1 \in [-4.5, -1.9]$, $z_2 \in [-1.51, -1.43]$, $z_3 \in [0.59, 0.62]$, and $z_4 \in [3.6, 5.7]$

14. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{20x^3 + 62x^2 - 16}{x + 3}$$

- A. $a \in [-60, -57]$, $b \in [242, 243]$, $c \in [-730, -721]$, and $r \in [2161, 2168]$.
- B. $a \in [-60, -57]$, $b \in [-119, -110]$, $c \in [-354, -349]$, and $r \in [-1080, -1074]$.
- C. $a \in [18, 23]$, $b \in [-2, 7]$, $c \in [-13, -1]$, and $r \in [-2, 3]$.
- D. $a \in [18, 23]$, $b \in [-18, -15]$, $c \in [70, 76]$, and $r \in [-311, -303]$.
- E. $a \in [18, 23]$, $b \in [120, 128]$, $c \in [364, 373]$, and $r \in [1076, 1088]$.

15. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{10x^3 - 30x^2 + 43}{x - 2}$$

- A. $a \in [16, 23]$, $b \in [9, 11]$, $c \in [12, 29]$, and $r \in [81, 88]$.
- B. $a \in [16, 23]$, $b \in [-70, -67]$, $c \in [139, 141]$, and $r \in [-239, -231]$.
- C. $a \in [6, 13]$, $b \in [-20, -15]$, $c \in [-21, -18]$, and $r \in [21, 24]$.
- D. $a \in [6, 13]$, $b \in [-19, -7]$, $c \in [-21, -18]$, and $r \in [-1, 4]$.
- E. $a \in [6, 13]$, $b \in [-50, -48]$, $c \in [95, 104]$, and $r \in [-158, -154]$.

16. Factor the polynomial below completely, knowing that $x + 4$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where

$z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 8x^4 - 10x^3 - 101x^2 + 238x - 120$$

- A. $z_1 \in [-2.15, -1.66]$, $z_2 \in [-1.58, -1.33]$, $z_3 \in [-0.52, -0.16]$, and $z_4 \in [3.33, 4.3]$
- B. $z_1 \in [-4.34, -3.6]$, $z_2 \in [0.46, 0.95]$, $z_3 \in [1.97, 2.28]$, and $z_4 \in [2.01, 2.65]$
- C. $z_1 \in [-2.68, -2.27]$, $z_2 \in [-2.16, -1.71]$, $z_3 \in [-0.92, -0.7]$, and $z_4 \in [3.33, 4.3]$
- D. $z_1 \in [-4.34, -3.6]$, $z_2 \in [0.37, 0.42]$, $z_3 \in [1.07, 1.43]$, and $z_4 \in [0.8, 2.23]$
- E. $z_1 \in [-3.35, -2.63]$, $z_2 \in [-2.16, -1.71]$, $z_3 \in [-0.64, -0.62]$, and $z_4 \in [3.33, 4.3]$

17. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 20x^3 - 43x^2 - 3x + 18$$

- A. $z_1 \in [-1.74, -1.55]$, $z_2 \in [1.33, 1.4]$, and $z_3 \in [1.74, 2.19]$
- B. $z_1 \in [-2.07, -1.88]$, $z_2 \in [-0.9, -0.68]$, and $z_3 \in [0.53, 0.61]$
- C. $z_1 \in [-2.07, -1.88]$, $z_2 \in [-0.47, 0.06]$, and $z_3 \in [2.75, 3.01]$
- D. $z_1 \in [-0.8, -0.48]$, $z_2 \in [0.43, 0.86]$, and $z_3 \in [1.74, 2.19]$
- E. $z_1 \in [-2.07, -1.88]$, $z_2 \in [-1.41, -1.21]$, and $z_3 \in [1.07, 1.95]$

18. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 25x^3 + 50x^2 - 9x - 18$$

- A. $z_1 \in [-3.1, -2.6]$, $z_2 \in [0.06, 0.51]$, and $z_3 \in [1.92, 2.63]$

- B. $z_1 \in [-1.9, -0.7]$, $z_2 \in [1.54, 1.86]$, and $z_3 \in [1.92, 2.63]$
 C. $z_1 \in [-1.5, 0.1]$, $z_2 \in [0.29, 1.22]$, and $z_3 \in [1.92, 2.63]$
 D. $z_1 \in [-2.1, -1.8]$, $z_2 \in [-1.91, -1.44]$, and $z_3 \in [1.3, 1.89]$
 E. $z_1 \in [-2.1, -1.8]$, $z_2 \in [-1.34, -0.43]$, and $z_3 \in [0.54, 0.97]$

19. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{10x^3 - 29x^2 - 50x + 26}{x - 4}$$

- A. $a \in [38, 42]$, $b \in [130, 134]$, $c \in [471, 482]$, and $r \in [1920, 1925]$.
 B. $a \in [5, 15]$, $b \in [-73, -61]$, $c \in [220, 231]$, and $r \in [-883, -870]$.
 C. $a \in [38, 42]$, $b \in [-190, -187]$, $c \in [704, 707]$, and $r \in [-2800, -2793]$.
 D. $a \in [5, 15]$, $b \in [0, 4]$, $c \in [-47, -45]$, and $r \in [-117, -112]$.
 E. $a \in [5, 15]$, $b \in [9, 14]$, $c \in [-13, -3]$, and $r \in [0, 7]$.

20. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{10x^3 - 85x^2 + 200x - 129}{x - 5}$$

- A. $a \in [49, 53]$, $b \in [-335, -331]$, $c \in [1872, 1879]$, and $r \in [-9510, -9502]$.
 B. $a \in [3, 11]$, $b \in [-136, -134]$, $c \in [875, 882]$, and $r \in [-4504, -4494]$.
 C. $a \in [3, 11]$, $b \in [-41, -33]$, $c \in [25, 28]$, and $r \in [-4, 1]$.
 D. $a \in [49, 53]$, $b \in [164, 171]$, $c \in [1020, 1033]$, and $r \in [4988, 5000]$.
 E. $a \in [3, 11]$, $b \in [-45, -44]$, $c \in [18, 23]$, and $r \in [-51, -48]$.

21. What are the *possible Rational* roots of the polynomial below?

$$f(x) = 5x^2 + 3x + 6$$

- A. All combinations of: $\frac{\pm 1, \pm 5}{\pm 1, \pm 2, \pm 3, \pm 6}$
- B. $\pm 1, \pm 2, \pm 3, \pm 6$
- C. $\pm 1, \pm 5$
- D. All combinations of: $\frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 5}$
- E. There is no formula or theorem that tells us all possible Rational roots.

22. What are the *possible Integer* roots of the polynomial below?

$$f(x) = 4x^3 + 5x^2 + 7x + 5$$

- A. All combinations of: $\frac{\pm 1, \pm 5}{\pm 1, \pm 2, \pm 4}$
- B. $\pm 1, \pm 5$
- C. $\pm 1, \pm 2, \pm 4$
- D. All combinations of: $\frac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 5}$
- E. There is no formula or theorem that tells us all possible Integer roots.

23. Factor the polynomial below completely, knowing that $x - 2$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3 \leq z_4$. *To make the problem easier, all zeros are between -5 and 5.*

$$f(x) = 15x^4 - 71x^3 + 12x^2 + 116x + 48$$

- A. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [0.55, 0.73]$, and $z_4 \in [-0.06, 1]$
- B. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [1.36, 1.63]$, and $z_4 \in [1.29, 2.3]$
- C. $z_1 \in [-5.2, -2.7]$, $z_2 \in [-2.28, -1.89]$, $z_3 \in [0.08, 0.3]$, and $z_4 \in [2.98, 3.64]$

- D. $z_1 \in [-0.8, -0.3]$, $z_2 \in [-0.67, -0.27]$, $z_3 \in [1.8, 2.48]$, and $z_4 \in [3.99, 4.54]$
- E. $z_1 \in [-2, -1]$, $z_2 \in [-1.72, -1.24]$, $z_3 \in [1.8, 2.48]$, and $z_4 \in [3.99, 4.54]$

24. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{8x^3 - 24x^2 + 27}{x - 2}$$

- A. $a \in [14, 18]$, $b \in [8, 9]$, $c \in [16, 17]$, and $r \in [58, 60]$.
- B. $a \in [14, 18]$, $b \in [-56, -55]$, $c \in [109, 118]$, and $r \in [-197, -196]$.
- C. $a \in [5, 10]$, $b \in [-11, -2]$, $c \in [-16, -11]$, and $r \in [-5, -4]$.
- D. $a \in [5, 10]$, $b \in [-17, -12]$, $c \in [-16, -11]$, and $r \in [7, 17]$.
- E. $a \in [5, 10]$, $b \in [-43, -39]$, $c \in [74, 87]$, and $r \in [-135, -130]$.

25. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{16x^3 + 84x^2 - 97}{x + 5}$$

- A. $a \in [16, 19]$, $b \in [164, 167]$, $c \in [820, 821]$, and $r \in [4001, 4004]$.
- B. $a \in [16, 19]$, $b \in [1, 6]$, $c \in [-20, -18]$, and $r \in [-1, 4]$.
- C. $a \in [-82, -76]$, $b \in [-320, -311]$, $c \in [-1583, -1577]$, and $r \in [-7999, -7993]$.
- D. $a \in [-82, -76]$, $b \in [482, 491]$, $c \in [-2420, -2411]$, and $r \in [12002, 12004]$.
- E. $a \in [16, 19]$, $b \in [-12, -9]$, $c \in [69, 77]$, and $r \in [-535, -527]$.

26. Factor the polynomial below completely, knowing that $x - 5$ is a factor. Then, choose the intervals the zeros of the polynomial belong to, where

$z_1 \leq z_2 \leq z_3 \leq z_4$. To make the problem easier, all zeros are between -5 and 5.

$$f(x) = 8x^4 - 30x^3 - 87x^2 + 155x + 150$$

- A. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.56, 0.64]$, and $z_4 \in [2.55, 3.08]$
- B. $z_1 \in [-1.8, -1.1]$, $z_2 \in [-0.43, -0.15]$, $z_3 \in [1.84, 2.03]$, and $z_4 \in [4.4, 5.57]$
- C. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.34, 0.55]$, and $z_4 \in [0.91, 1.86]$
- D. $z_1 \in [-6.2, -4.4]$, $z_2 \in [-2.15, -1.97]$, $z_3 \in [0.67, 0.99]$, and $z_4 \in [2.14, 2.86]$
- E. $z_1 \in [-4, -2.2]$, $z_2 \in [-0.79, -0.71]$, $z_3 \in [1.84, 2.03]$, and $z_4 \in [4.4, 5.57]$

27. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. To make the problem easier, all zeros are between -5 and 5.

$$f(x) = 20x^3 - 83x^2 - 95x + 50$$

- A. $z_1 \in [-1.16, -0.26]$, $z_2 \in [2.38, 3.36]$, and $z_3 \in [4.32, 5.39]$
- B. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-2.8, -1.73]$, and $z_3 \in [0.34, 0.82]$
- C. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-0.35, -0.02]$, and $z_3 \in [4.32, 5.39]$
- D. $z_1 \in [-5.24, -4.84]$, $z_2 \in [-1.03, -0.32]$, and $z_3 \in [1.09, 1.48]$
- E. $z_1 \in [-1.45, -1.22]$, $z_2 \in [-0.07, 0.58]$, and $z_3 \in [4.32, 5.39]$

28. Factor the polynomial below completely. Then, choose the intervals the zeros of the polynomial belong to, where $z_1 \leq z_2 \leq z_3$. To make the problem easier, all zeros are between -5 and 5.

$$f(x) = 20x^3 - 77x^2 + 89x - 30$$

- A. $z_1 \in [0.74, 0.84]$, $z_2 \in [1.47, 1.68]$, and $z_3 \in [1.89, 2.27]$

- B. $z_1 \in [0.49, 0.73]$, $z_2 \in [1.14, 1.3]$, and $z_3 \in [1.89, 2.27]$
 C. $z_1 \in [-2.22, -1.99]$, $z_2 \in [-1.85, -1.62]$, and $z_3 \in [-0.9, -0.71]$
 D. $z_1 \in [-2.22, -1.99]$, $z_2 \in [-1.28, -1.13]$, and $z_3 \in [-0.63, -0.44]$
 E. $z_1 \in [-3.19, -2.76]$, $z_2 \in [-2.02, -1.87]$, and $z_3 \in [-0.35, -0.18]$

29. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{6x^3 - 46x^2 + 88x - 43}{x - 5}$$

- A. $a \in [1, 13]$, $b \in [-26, -19]$, $c \in [-4, 3]$, and $r \in [-43, -40]$.
 B. $a \in [1, 13]$, $b \in [-77, -70]$, $c \in [465, 475]$, and $r \in [-2386, -2380]$.
 C. $a \in [26, 32]$, $b \in [102, 112]$, $c \in [605, 610]$, and $r \in [2996, 3001]$.
 D. $a \in [26, 32]$, $b \in [-198, -189]$, $c \in [1064, 1072]$, and $r \in [-5386, -5379]$.
 E. $a \in [1, 13]$, $b \in [-19, -13]$, $c \in [8, 14]$, and $r \in [-7, 2]$.

30. Perform the division below. Then, find the intervals that correspond to the quotient in the form $ax^2 + bx + c$ and remainder r .

$$\frac{12x^3 - 64x^2 + 100x - 52}{x - 3}$$

- A. $a \in [8, 17]$, $b \in [-28, -25]$, $c \in [14, 17]$, and $r \in [-4, 0]$.
 B. $a \in [8, 17]$, $b \in [-100, -98]$, $c \in [400, 402]$, and $r \in [-1254, -1246]$.
 C. $a \in [33, 45]$, $b \in [39, 48]$, $c \in [226, 233]$, and $r \in [642, 646]$.
 D. $a \in [33, 45]$, $b \in [-175, -166]$, $c \in [616, 624]$, and $r \in [-1903, -1893]$.
 E. $a \in [8, 17]$, $b \in [-44, -38]$, $c \in [19, 21]$, and $r \in [-19, -11]$.